

## ON THE VALUE OF LAVERAN'S ORGANISMS IN THE DIAGNOSIS OF MALARIA.

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The attitude of the profession on the question of micro-organisms of malaria is one of judicious skepticism. Between the bacillus malarie of Klebs and Tomassi-Crudelli, and the protozoa described by Laveran, the average doctor cannot be expected to decide; but even among workers and teachers, there is by no means unanimity. So far as I know, there has been no confirmation of the observations of the first named authors on a specific bacillus in the disease. It is far otherwise with the organisms described by Laveran, whose work has now been confirmed by competent observers in Italy, America and India. I do not know of a single clinician or pathologist, living in a suitable region, who has really worked at the subject, who has not been convinced of the truth of Laveran's statements. Doubtless many have had my experience. In 1886, at the meeting of the "Association of American Physicians," when Dr. Councilman presented a summary of Laveran's views, I (speaking out of the fulness of my ignorance) was extremely skeptical. When I had the opportunity of giving to the question, the study which its importance demanded, I was soon convinced, and I had the satisfaction of confirming, in almost every particular, the observations which Laveran had made, and discussed the whole subject in a paper, published in the *British Medical Journal*, March 12, 1887. For the past two years, at the Philadelphia and University Hospitals, I have had abundant opportunities of studying cases of malaria, with an ever-deepening conviction that the organisms of Laveran are peculiar to the disease.

The experience of Dr. Vandyke Carter, Principal of the Grant Medical College, Bombay, one of the most distinguished pathologists in India, appears to have been very similar to my own. He, too, had been rather repelled by the apparently extraordinary statements of Laveran, and had not given careful study to the subject, until the appearance of my paper in the *British Medical Journal*. His elaborate contribution to the subject, one of the most important which has been made, confirms in almost every detail the statements of the French observer. To the impartial student, this remarkable unanimity in observations made by Laveran in Algiers, by Marchiafava and Celli and Golgi in Italy, by Councilman, James and myself in this country, and, by Vandyke Carter in India, should, to say the least, carry conviction as to the importance and constancy of these bodies in malaria. While it may be a little early to ask acceptance of the view that these organisms constitute the specific germ of the disease, the work already done warrants positively the statement that they are peculiar to and diagnostic of the presence of the malarial poison. It is not surprising that certain observers, who have perhaps seen but few cases, have been inclined to regard the changes in the red corpuscles as degenerative rather than as the manifestations of an intra cellular parasite; but the study of the remarkable serial development of the segmenting forms described by Golgi cannot possibly be explained by any other view, than that we are dealing here with an independent organism. The crescentic bodies, too, are so peculiar, so characteristic, so unlike anything which we meet with in the blood in other conditions, that I have usually found it an easy matter to convert the most hardened unbeliever by a demonstration of their presence in a few cases. Still more remarkable are the flagellate organisms.

Putting aside, for the time, until the complete life history of these organisms shall be worked out, the question of their etiological relation to the disease, I would briefly refer to their diagnostic importance. In my former paper, I gave in this connection several interesting illustrations. Since that date, I have, in an increased experience, become even more convinced of the really great value in doubtful cases of these blood examinations. In ordinary intermittent fever, of recent origin, there is hardly ever any question in the diagnosis, and any doubts which may exist, quinine readily clears up. The value of the blood examination lies particularly in the chronic cases and in anomalous forms. Here one has to be constantly on guard and it may be impossible for days to determine definitely the nature of the affection. We have since the opening of the hospital, admitted twenty-four cases of malaria to the wards, of which, in seven instances, the diagnosis was definitely determined by blood examination, and could have been determined in no other manner. So important do we consider it, that we now, as a matter of routine, examine the blood of all cases of fever, and indeed all cases of low temperature, which seem so peculiar in certain forms of chronic malarial poison. We had a salutary

lesson in the early part of the summer, in the case of an old man, aged 81, admitted July 25th, with a temperature of 104°. He had on the 9th, a heat stroke, while picking berries, was better the next day and kept about until his admission. There were signs of bronchitis at the bases of the lungs, and in the right inter-scapular region, the note was higher pitched and the breathing tubular. The temperature rose to 105°, and throughout the 26th, 27th and 28th, kept between 101° and 103°; on the 28th, between the hours of 6 and 12 a. m., the temperature was subnormal, but he had no chills. He was extremely feeble, not cachectic or sallow; the pulse was very irregular. Neither I nor Dr. Atkinson, who saw the case for me during an absence of three days, had any other idea than that the case was one of low pneumonia in an elderly man. The patient died on the 8th day of his admission, and to my surprise and chagrin the post-mortem examination of the blood and spleen showed the case to have been one of malarial fever. Had a thorough blood examination been made and full doses of quinine administered, the man's life might have been saved. In five or six cases of irregular fever, the presence of the organisms in the blood has determined the nature of the disease.

The routine examination is really not tedious, and we have adopted it now in the dispensary, as well as in the wards. Unfortunately for the general practitioner, the determination of the intra-cellular forms requires a tolerably high power with good illumination. We use the one-twelfth immersion, but with care a good eighth is sufficient, and in the chronic cases, with the crescents in the blood, a sixth suffices. It is important to have the finger tip, from which the blood is drawn, thoroughly cleansed, and it is best to take a very small drop of blood, so as to have the layer uniformly and thinly spread out with the corpuscles isolated not in rouleaux.

Briefly to summarize for the information of those who may not have access to monographs on the subject, the following are the important facts relating to these organisms:—First; In the acute forms of malaria there exists, within certain of the red corpuscles, amoeboid bodies, usually pigmented, which undergo a definite evolution, increasing in size, gradually filling the entire corpuscles, and which prior to and during the chill, undergo a remarkable segmentation. There are also, in some cases, free pigmented bodies. To the form within the corpuscles, which undergoes changes, the term *plasmodium* has been applied. Occasionally in acute forms, flagellate bodies are seen free in the blood, presenting from three to eight long, actively moving cilia. According to Councilman, these are much more common in blood withdrawn from the spleen.

Second; In more chronic cases, particularly in the forms of remittent fever, which are so apt to be taken for typhoid, the corpuscles do not so often present the intercellular forms, but there are remarkable ovoid, rounded and crescentic bodies deeply pigmented. These are, in all probability, related to and developed from intercellular forms. From certain of these, particularly the ovoid and rounded forms, the flagellate bodies may be seen to develop. Dr. Ghiskey has recently been studying the evolution of these forms in the Clinical Laboratory, and has been able to demonstrate on many occasions the development of the flagellate bodies from ovoid-rounded forms.

I hope, in an early number of the forthcoming Hospital Reports, to review fully the present status of the malaria question and to report our experience, particularly in the anomalous forms of fever in which the blood examination is so important. It is particularly to be desired that those who have ample opportunities for the study, shall approach the problem with unbiassed minds. It requires a little patience in order to become thoroughly familiar with the various phases of development of the organism. Additional workers are needed. We have yet to determine fully the relation of the forms to each other and the complete life history of the parasite in the body; and, what is much more important, to ascertain its existence outside and to learn the conditions of its development and the way in which it gains access to the body.

A ready method of separating malarial from other forms of fever will prove a great boon to southern physicians. Dr. Carter's paper contains many illustrations of the value of Laveran's observations in this respect, and workers in sub-tropical and tropical regions cannot longer afford to neglect so valuable an aid in diagnosis.